**Analysis of Global Warming Using Machine Learning**

The paper explores the use of machine learning to analyze the causes and effects of global warming, which is a major environmental and social issue. The paper uses various machine learning techniques, such as regression, classification, clustering, and deep learning, to process and visualize the data related to global warming, such as temperature, precipitation, greenhouse gas emissions, sea level rise, etc. The paper also applies machine learning to predict the future scenarios of global warming and its impacts on different regions and sectors. The paper demonstrates that machine learning can be a powerful tool to understand and mitigate global warming and its consequences.

**Machine learning for renewable energy materials**

The paper reviews the applications of machine learning for renewable energy materials, which are essential for the transition to a low-carbon economy. The paper focuses on three types of renewable energy materials: solar cells, batteries, and thermo electrics. The paper discusses how machine learning can be used to accelerate the discovery, design, and optimization of these materials, by exploiting the large and complex data sets generated by experiments and simulations. The paper also highlights the challenges and opportunities of machine learning for renewable energy materials, such as data quality, interpretability, uncertainty, and integration.

# **Derived land evapotranspiration due to global warming**

The paper examines the recent trends of land evapotranspiration, which is the process of water loss from the land surface to the atmosphere, due to global warming. The paper uses a new data set of observation-derived land evapotranspiration, which covers the period from 1982 to 2016, and compares it with other data sets and models. The paper finds that land evapotranspiration has increased significantly in the past three decades, mainly driven by the increase in atmospheric demand for water vapor. The paper also discusses the implications of land evapotranspiration changes for the global water cycle, energy balance, and carbon cycle

# **Minimizing the global warming impact of pavement infrastructure through reinforcement learning**

The paper proposes a reinforcement learning approach to minimize the global warming impact of pavement infrastructure, which is a significant source of greenhouse gas emissions. The paper formulates the pavement management problem as a Markov decision process, where the agent can choose from different actions, such as maintenance, rehabilitation, or reconstruction, to optimize the pavement performance and reduce the emissions. The paper applies the Q-learning algorithm to learn the optimal policy for different pavement types and scenarios. The paper demonstrates that the reinforcement learning approach can achieve significant savings in both costs and emissions, compared to the conventional methods.

**Regression Models for Predicting the Global Warming Potential of Thermal Insulation Materials**

The paper develops regression models for predicting the global warming potential (GWP) of thermal insulation materials, which are widely used in buildings to reduce energy consumption and emissions. The paper uses a data set of 90 thermal insulation materials, with 12 input variables and one output variable (GWP). The paper compares four types of regression models: linear regression, polynomial regression, artificial neural network, and support vector regression. The paper evaluates the models using various criteria, such as coefficient of determination, root mean square error, and mean absolute percentage error. The paper finds that the support vector regression model performs the best in terms of accuracy and robustness.

**Machine Learning the Warm Rain Process**

The paper explores the use of machine learning to simulate the warm rain process, which is the formation of raindrops from cloud droplets in warm clouds. The paper uses a data set of cloud microphysical properties, such as droplet number concentration, liquid water content, and rain rate, obtained from a large-eddy simulation model. The paper trains a deep neural network to learn the relationship between the input and output variables of the warm rain process and compares it with a traditional parameterization scheme. The paper shows that the machine learning approach can capture the nonlinear and complex features of the warm rain process and improve the accuracy and efficiency of the simulation.

**Comparative Study on Machine Learning for Urban Building Energy Analysis**

The paper conducts a comparative study on machine learning for urban building energy analysis, which is an important task for optimizing the energy performance and sustainability of buildings. The paper uses a data set of 384 buildings in New York City, with 14 input variables and one output variable (annual energy use intensity). The paper compares six machine learning algorithms: linear regression, decision tree, random forest, k-nearest neighbor, support vector machine, and artificial neural network. The paper evaluates the algorithms using various metrics, such as mean absolute error, coefficient of variation of root mean square error, and R-squared. The paper finds that the artificial neural network performs the best in terms of accuracy and generalization.

**Quantitative Analysis of the Global Warming Impact on Marine Ecosystems**

The paper proposes a machine learning strategy for the quantitative analysis of the impact of global warming on marine ecosystems, which are vulnerable to the changes in ocean temperature and acidity. The paper uses a data set of 12 marine species, with 10 input variables and one output variable (population growth rate). The paper applies a genetic algorithm to select the optimal subset of input variables, and then trains a support vector machine to model the relationship between the input and output variables. The paper validates the model using cross-validation and sensitivity analysis. The paper shows that the machine learning strategy can provide accurate and reliable predictions of the population growth rate of marine species under different global warming scenarios.

**Predicting Spatially Explicit Life Cycle Global Warming and Eutrophication Impacts from Corn Production**

The paper compares machine learning approaches for predicting spatially explicit life cycle global warming and eutrophication impacts from corn production, which is a major crop in the United States. The paper uses a data set of 12,000 corn fields, with 19 input variables and two output variables (global warming potential and eutrophication potential). The paper compares four machine learning algorithms: linear regression, random forest, gradient boosting, and artificial neural network. The paper evaluates the algorithms using various metrics, such as root mean square error, mean absolute error, and coefficient of determination. The paper finds that the gradient boosting algorithm performs the best in terms of accuracy and robustness.

**Global Warming Analysis and Prediction Using Data Science**

The paper presents a global warming analysis and prediction using data science, which is an interdisciplinary field that combines statistics, computer science, and domain knowledge. The paper uses a data set of global temperature anomalies, greenhouse gas emissions, and solar radiation, obtained from various sources, such as NASA, NOAA, and IPCC. The paper applies various data science techniques, such as data preprocessing, exploratory data analysis, feature engineering, and machine learning, to process and visualize the data, and to build predictive models. The paper shows that the data science approach can provide useful insights and forecasts of the global warming phenomenon and its impacts.

**Quantifying the Carbon Emissions of Machine Learning**

The paper aims to quantify the carbon emissions of machine learning, which is an important aspect of the environmental impact of artificial intelligence. The paper introduces a tool called CodeCarbon, which can estimate the carbon emissions of machine learning experiments based on the energy consumption, location, and hardware used. The paper also presents a case study of applying CodeCarbon to several machine learning tasks, such as natural language processing, computer vision, and reinforcement learning. The paper shows that the carbon emissions of machine learning can vary significantly depending on the choice of algorithm, data set, hyperparameters, and hardware. The paper suggests that machine learning practitioners should be aware of the carbon footprint of their experiments and adopt best practices to reduce it.

**Global Warming Analysis and Prediction Using Data Science**

The paper proposes a machine learning model for air quality prediction for smart cities, which is a crucial task for improving the health and well-being of urban residents. The paper uses a data set of air quality parameters, such as PM2.5, PM10, NO2, SO2, CO, and O3, collected from 12 monitoring stations in Beijing, China. The paper applies a deep neural network with long short-term memory (LSTM) units to capture the temporal and spatial dependencies of the air quality data. The paper evaluates the model using various metrics, such as mean absolute error, root mean square error, and coefficient of determination. The paper shows that the machine learning model can achieve high accuracy and reliability in predicting the air quality for different locations and time horizons.

# **Machine-learning ensembled CMIP6 projection reveals socio-economic pathways will aggravate global warming and precipitation extreme**

The paper applies a machine learning approach to ensemble the CMIP6 projections, which are the latest generation of climate models, and to analyze the global warming and precipitation extreme changes under different socio-economic pathways, which are scenarios of future human development and greenhouse gas emissions. The paper uses a deep neural network with long short-term memory (LSTM) units to ensemble the CMIP6 models and to reduce the uncertainties and biases of the projections. The paper shows that the socio-economic pathways will have a significant impact on the magnitude and spatial distribution of the global warming and precipitation extreme changes, and that some pathways will aggravate the changes more than others. The paper suggests that the machine learning approach can provide useful information for climate change assessment and adaptation.

**Deep learning techniques for observing the impact of the global warming from satellite images of water – bodies**

The paper proposes a deep learning approach to observe the impact of global warming from satellite images of water-bodies, which are sensitive indicators of climate change. The paper aims to detect and monitor the changes in shape and size of the water-bodies over time, which can reflect the effects of global warming on the water cycle and the ecosystem. The paper uses deep learning techniques to perform both semantic and instance segmentation on the satellite images, which can separate the water-bodies from the background and identify each individual water-body respectively. The paper also implements different data augmentation techniques to enhance the quality and diversity of the data, and to improve the performance and robustness of the deep learning models. The paper evaluates the proposed approach on two datasets, one synthetic and one real, and compares it with some baseline methods. The paper shows that the proposed approach can achieve high accuracy and efficiency in observing the impact of global warming from satellite images of water-bodies.

**Climebot: An argumentative agent for climate change**

The paper that presents a conversational agent that can explain issues related to global warming and provide arguments for or against different positions. The agent uses API.AI, a natural language processing platform, to handle user queries and generate responses. The agent also uses climate change ontologies converted into a format suitable for API.AI to exploit domain knowledge and provide relevant information. The paper evaluates the agent’s performance on a set of test queries and compares it with other existing agents. The paper concludes that the agent can effectively engage users in a dialogue about climate change and provide arguments based on facts and logic.

**Evaluation of Machine Learning Methods Application in Temperature Prediction**

The paper compares the performance of four machine learning methods (linear regression, support vector machine, artificial neural network and random forest) for predicting daily average temperature based on historical data from 12 weather stations in Poland.The paper uses root mean square error (RMSE), mean absolute error (MAE) and coefficient of determination (R2) as evaluation metrics to assess the accuracy of the predictions.The paper finds that random forest has the best performance among the four methods, followed by artificial neural network, support vector machine and linear regression.The paper also analyzes the influence of different input features (such as air pressure, humidity, wind speed, etc.) on the prediction results and suggests that air pressure is the most important feature for temperature prediction.

**Analysis of global warming in India over maximum temperature using Pearson and machine learning**

The paper aims to predict the real-time data of aggregated maximum temperature (1.2 m above sea level) data from more than 350 stations spread over India and analyze the trend of global warming over the years.The paper uses linear regression, Pearson correlation and machine learning methods to model the relationship between maximum temperature and other variables such as rainfall, humidity, wind speed and solar radiation.The paper finds that there is a positive correlation between maximum temperature and solar radiation, and a negative correlation between maximum temperature and rainfall, humidity and wind speed.The paper also finds that the machine learning method (using random forest) has the best performance in terms of accuracy, precision, recall and F1-score compared to linear regression and Pearson correlation.

**Global Warming Prediction in India using Machine Learning**

The paper evaluates the performance of several machine learning algorithms (linear regression, multi-regression tree, support vector regression and lasso) in the problem of annual global warming prediction, from previous measured values over India. The paper uses annual mean temperature as the target variable and year, rainfall, humidity, wind speed and solar radiation as the input variables to train and test the models. The paper compares the models based on mean absolute error (MAE), root mean square error (RMSE) and coefficient of determination (R2) as evaluaton metrics. The paper finds that support vector regression has the best performance among the four algorithms, followed by lasso, multi-regression tree and linear regression.

**Anthropogenic influence on global warming for effective cost-benefit analysis: a machine learning perspective**

The paper uses global mean temperature as the dependent variable and natural and anthropogenic factors (such as solar irradiance, volcanic activity, greenhouse gases, aerosols, etc.) as the independent variables to build and compare different models.The paper evaluates the models based on Akaike information criterion (AIC), Bayesian information criterion (BIC) and adjusted R2 as selection criteria. The paper finds that the best model is a random forest that includes all the natural and anthropogenic factors, and that the most important factor is the carbon dioxide concentration. The paper also estimates the marginal damage cost of carbon dioxide emissions and suggests that it is higher than the current carbon price.

**Using machine learning to build temperature-based ozone parameterizations for climate sensitivity simulations**

The paper develops a machine learning algorithm that can predict ozone distributions based on temperature data. The paper tests the algorithm on preindustrial and abrupt 4xCO2 simulations and compares it with a standard ozone parameterization. The paper shows that the algorithm is more accurate and variable than the standard parameterization, and that it can capture the ozone feedbacks on climate sensitivity.